

Climatology of 15 years of North Atlantic upper tropospheric relative humidity in-situ measurements by the MOZAIC programme

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Water vapour is a major parameter in weather prediction and climate research. However, the interaction between water vapour in the upper troposphere and lowermost stratosphere (UTLS) and tropopause dynamics are not well understood. Furthermore, the knowledge about potential trends and feedback mechanisms of upper troposphere/lower stratosphere water vapour is low because of the large variability of observations and relatively short data records.

Since 1994, upper tropospheric humidity (UTH) data with high spatial and temporal resolution are provided by the in-situ measurements aboard civil passenger aircraft from the MOZAIC/IAGOS-programme (www.iagos.org). The measurement system is based on a capacitive hygrometer with a simultaneous temperature measurement. Comparison studies against research-grade water vapour instruments demonstrated successfully the qualification of the MOZAIC Capacitive Hygrometer (MCH) and its improved successor IAGOS Capacitive Hygrometer (ICH) for the use in long-term observation programmes. Moreover, the continuation of high data quality is confirmed for the transition from MCH to ICH (see P. Neis et al., 2015).

After the reanalysis of the relative humidity data from 1994 to 2009 (see H. Smit et al., 2014), this extensive and unique data set is examined by criteria of continuity, homogeneity and quantity of data coverage, to identify global regions suitable for UTH climatology and trend analyses.

For the identified target region above the North Atlantic time series and climatologies of, e.g., relative humidity with respect to ice, temperature, and absolute humidity are investigated. Different data sets selected according to geographic and atmospheric dynamics criteria and different tropopause definitions are compared for the robustness of the obtained results.